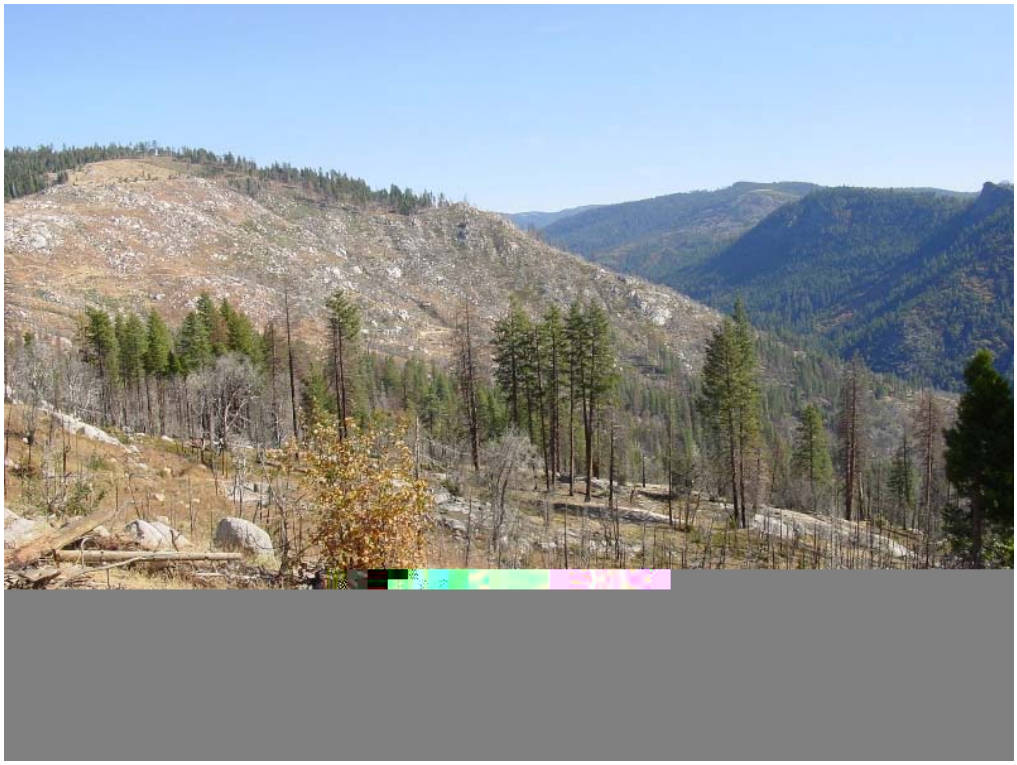
Final Environmental Impact Statement
Freds Fire Reforestation



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For Information Contact: Robert Carroll
4260 Eight Mile Road
Camino, CA 95709
(530) 647-5386
www.fs.fed.us/r5/eldorado

Freds Fire Reforestation

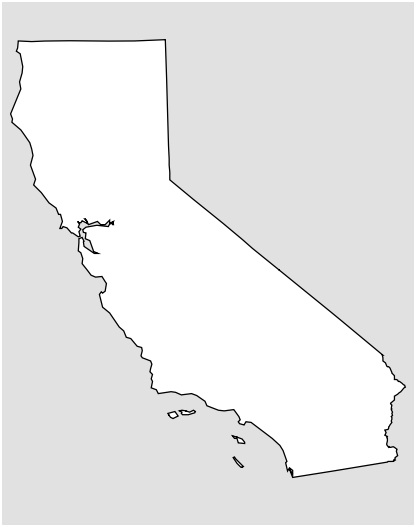
Final Environmental Impact Statement

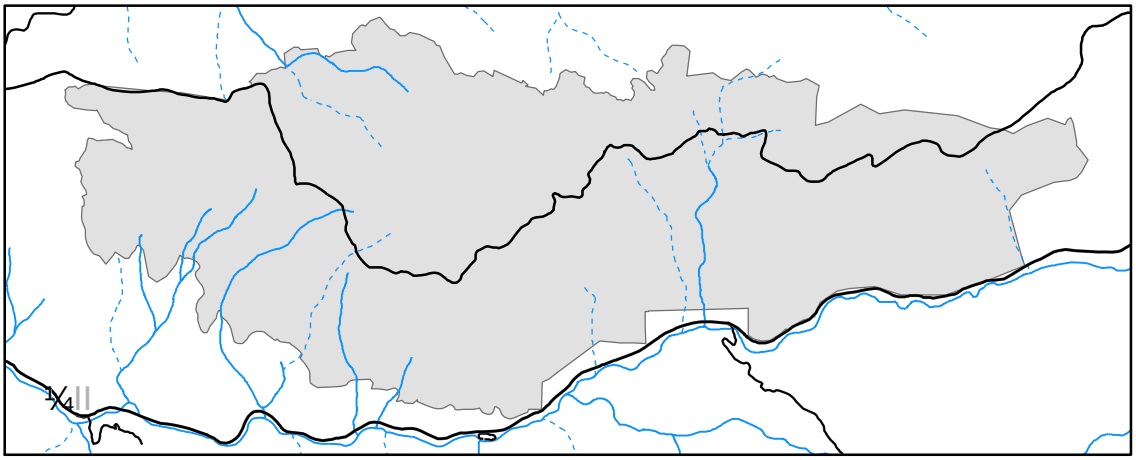
El Dorado County, California

Lead Agency	**USDA Forest Service**
Responsible Official	**Ramiro Villalvazo, Forest Supervisor** Eldorado National Forest 100 Forni Road Placerville CA 95667
For Information and Copies of the FEIS, Contact:	**Robert Carroll, IDT Leader** Placerville Ranger District 4260 Eight Mile Road, Camino CA 95709 (530) 647-5386

Abstract: *The Final Environmental Impact Statement (FEIS) documents the analysis of three alternatives for site preparation, planting of trees, release, fuel treatments, and invasive plant treatments on the Freds Fire on the Eldorado National Forest. Alternative 1 proposes site preparation, planting of trees, release, fuel treatments, and invasive plant treatments. Site preparation, release, and invasive plant treatments include the use of herbicides to control vegetation. Alternative 2 proposes no action. Alternative 3 proposes the same activities as Alternative 1, except that hand methods are proposed for site preparation, release, and invasive plant treatments, and fewer acres are proposed for planting and release. Alternative 3 emphaszes non-chemical methods.*

Vicinity Maps





Summary

Introduction

The Freds Fire was reported in the late afternoon of October 13, 2004, on the north side of Highway 50 approximately 1½ miles east of the communities of Silver Fork and Kyburz, in El Dorado County.

After ignition, the fire quickly spread across extremely steep slopes, burning through timber and heavy fuels. The fire burned rapidly in a westerly direction, parallel to Highway 50, driven by strong east winds. Highway 50 was closed immediately, the communities of Silver Fork and Kyburz were evacuated, and suppression efforts focused on protecting the towns and their infrastructure. The fire burned approximately 7,560 acres on the Eldorado National Forest (ENF) and on private timberlands.

The fire burned with varying intensity. Many areas of the fire burned at high and moderate intensity, killing 75%-100% of the trees and burning the duff and litter that protects the soil. In these areas, the fire resulted in high rates of soil erosion, sedimentation to streams, destruction of wildlife habitat for sensitive species, and loss of old forest. Subsequent to the fire, the ENF prepared an environmental impact statement (EIS), the Freds Fire Restoration FEIS and Record of Decision (ROD), signed August 1, 2005, to address long-term fuel loading, dead tree removal, road repair and public safety (USDA 2005a). Dead and dying trees were removed from the project area during the summer and fall of 2005.

Three decision memos were prepared to replant burned Cleveland Fire plantations and to begin initial planting on a portion of the harvested areas. About 1,868 acres have been planted.

The project area for this analysis is the approximately 4,320 acre portion of the Freds Fire that is within the Placerville and Pacific Ranger District administrative boundaries of the ENF, in El Dorado County, California.

The Sierra Nevada Forest Plan Amendment Record of Decision (USDA 2004b) land allocations within the Freds Fire boundary include defense zone, threat zone, and general forest. In addition, there are two protected activity centers (PACs) for spotted owls; spotted owl home range core areas; and riparian conservation areas adjacent to perennial, seasonal, and ephemeral streams within the Freds Fire boundary. Highway 50 is a state designated Scenic Highway. The South Fork American River was found to be eligible as a Wild and Scenic Recreation River in 1990. A suitability study has not been completed for the river and it has not been proposed for congressional designation. In addition, the Pony Express Trail, a National Recreation and Historic Trail, bisects the project and is a linear feature that parallels Highway 50.

The goal of this project is to move the area toward desired future conditions as defined by the Sierra Nevada Forest Plan Amendment (SNFPA ROD, pgs. 36-48). Desired conditions, management intents, and management objectives for fuels and vegetation management activities within each land allocation are described in detail in Table 1. There is a need to develop these desired conditions over the long term in the burned areas where site capability allows. In the short term, burned areas would be managed for young forest dependent species.

Table 1. Land Allocations and Desired Conditions (SNFPA ROD, pgs. 45-48)

Land Allocation	Desired Conditions	Management Intent	Management Objectives
Old Forest Emphasis Areas	Forest structure and function generally resemble pre-settlement conditions. High levels of horizontal and vertical diversity exist within 10,000 acre landscapes. Stands are composed of roughly even-aged vegetation groups, varying in size, species composition, and structure. Individual vegetation groups range from less than 0.5 to more than 5 acres in size. Tree sizes range from seedlings to very large diameter trees. Species composition varies by elevation, site productivity, and related environmental factors. Multi-tiered canopies, particularly in older forests, provide vertical heterogeneity. Dead trees, both standing and fallen, meet habitat needs of old-forest-associated species. Where possible, areas treated for fuels also provide for the successful establishment of early seral stage vegetation.	Maintain or develop old forest habitat in: areas containing the best remaining large blocks or landscape concentrations of old forest and/or areas that provide old forest functions (such as connectivity of habitat over a range of elevations to allow migration of wide-ranging old-forest-associated species). Establish and maintain a pattern of area treatments that is effective in: modifying fire behavior. culturing stand structure and composition to generally resemble pre-settlement conditions. reducing susceptibility to insect/pathogen drought-related tree mortality. Focus management activities on the short-term goal of reducing the adverse effects of wildfire. Acknowledge the need for a longer-term strategy to restore both the structure and processes of these ecosystems.	Establish and maintain a pattern of area treatments that is effective in modifying wildfire behavior. Maintain and/or establish appropriate species composition and size classes. Reduce the risk of insect/pathogen drought-related mortality by managing stand density levels. Design economically efficient treatments to reduce hazardous fuels.
WUI *Threat Zones*	Under high fire weather conditions, wildland fire behavior in treated areas is characterized as follows: Flame lengths at the head of the fire are less than 4 feet. The rate of spread at the head of the fire is reduced to at least 50% of pre-treatment levels. Hazards to firefighters are reduced by managing snag levels in locations likely to be used for control in prescribed fire and fire suppression, consistent with safe practices guidelines. Production rates for fire line construction are doubled from pre-treatment levels.	Threat zones are priority area for fuels treatments. Fuels treatments in the threat zone provide a buffer between developed areas and wildlands. Fuels treatments protect human communities from wildland fires as well as minimize the spread of fires that might originate in urban areas. The highest density and intensity of treatments are located within the WUI.	Establish and maintain a pattern of area treatments that is effective in modifying wildfire behavior. Design economically efficient treatments to reduce hazardous fuels.

Land Allocation	Desired Conditions	Management Intent	Management Objectives
WUI *Defense Zones*	Stands are fairly open and dominated primarily by larger, fire tolerant trees. Surface and ladder fuel conditions are such that crown fire ignition is highly unlikely. The openness and discontinuity of crown fuels, both horizontally and vertically, result in very low probability of sustained crown fire.	Protect communities from wildfire and prevent the loss of life and property. WUI defense zones have highest priority for treatment (along with threat zones). The highest density and intensity of treatments are located within the WUI.	Create defensible space near communities, and provide a safe and effective area for suppressing fire. Design economically efficient treatments to reduce hazardous fuels.
California spotted owl and northern goshawk PACs	At least two tree canopy layers are present. Dominant and co-dominant trees average at least 24 inches dbh. Area within PAC has at least 60 to 70 percent canopy cover. Some very large snags are present (greater than 45 inches dbh). Levels of snags and down woody material are higher than average.	Maintain PACs so that they continue to provide habitat conditions that support successful reproduction of California spotted owls and northern goshawks.	Avoid vegetation and fuels management activities within PACs to the greatest extent feasible. Reduce hazardous fuels in PACs in defense zones when they create an unacceptable fire threat to communities. Where PACs cannot be avoided in the strategic placement of treatments, ensure effective treatment of surface, ladder, and crown fuels within treated areas. If nesting or foraging habitat in PACs is mechanically treated, mitigate by adding acreage to the PAC equivalent to the treated acreage wherever possible. Add adjacent acres of comparable quality wherever possible.
HRCAs	Within home ranges, HRCAs consist of large habitat blocks having: at least two tree canopy layers. at least 24 inches dbh in dominant and co-dominant trees. a number of very large (>45 inches dbh) old trees. at least 50-70% canopy cover. higher than average levels of snags and down woody material.	Treat fuels using a landscape approach for strategically placing area treatments to modify fire behavior. Retain existing suitable habitat, recognizing that habitat within treated areas may be modified to meet fuels objectives. Accelerate development of currently unsuitable habitat (in non-habitat inclusions, such as plantations) into suitable condition. Arrange treatment patterns and design treatment prescriptions to avoid the highest quality habitat (CWHR types 5M, 5D, and 6) wherever possible	Establish and maintain a pattern of fuels treatments that is effective in modifying wildfire behavior. Design treatments in HRCAs to be economically efficient and to promote forest health where consistent with habitat objectives.

The FEIS for Vegetation Management for Reforestation, pages 1-4 to 1-5 states:

> *Within the forest environment, plants compete with each other for sunlight, soil moisture and nutrients, and space. In California forests, because of the long dry season during late spring, summer, and early fall, the competition is primarily for soil moisture. Root and shoot growth generally is limited by moisture availability within plant tissues, temperature, nutrients, and energy (gained through photosynthesis). The major growth period for roots and shoots usually occurs in the spring because all conditions for growth are met. Growth ceases during the dry season when levels of soil moisture are so low that the plant cannot take up enough moisture to continue growth. Excessive moisture stress in conifers, caused by the long dry period and reductions in available soil moisture by competing plants, is the most frequent cause of insufficient growth and mortality in small conifers. Thus control of competing vegetation is needed in the commercial timber lands of the Region* [including the Eldorado National Forest].

While the above statement was primarily made regarding a timber yield objective, when seedling survival and growth are needed to accomplish other objectives, a seedling's physiological needs for sunlight, soil moisture and nutrients, and space remain the same. As a practical measure, a short-term silvicultural goal is to keep competing vegetation levels below twenty percent (total live ground cover) for a period of two to three years after planting. This objective is based on plantation studies in California which have shown that levels below 20-30 percent crown cover are necessary to maintain seedling survival and growth (refer to McDonald and Fiddler, 1989).

Currently the establishment of grasses, shrubs, and other vegetation, while variable, averages 65 percent cover over the analysis area. Establishment of greater than 20 to 30 percent cover of vegetation presents a potential lethal environment to conifer seedlings as demonstrated by current third year seedling survival rates of 40 percent.

Examination of the areas planted in the project area indicate that adequate survival and growth are threatened by competing vegetation. Management of competing vegetation is essential to assure continued survival and growth of the remaining conifers and to allow planting /interplanting in units currently not meeting the marginal stocking levels needed (100 TPA) to meet desired future conditions.

There is a need to control competing vegetation that greatly affects tree growth rates. Control of competing vegetation would increase conifer growth rates. Increased growth would accelerate the development of key habitat and old forest characteristics and reduce the risk of loss to wildland fire (SNFP ROD, page 49). Annual height growth of planted conifers in the Freds Fire, measured on several representative units, ranges from about 0.3 feet to 0.5 feet per year, while total tree height averages about 0.75 feet on one year old trees to about 1.7 feet for three year old trees, well below the potential for this site.

There is a need to reestablish this forested landscape economically. Treatments in the reforestation process may include, but are not limited to, site preparation, planting, interplanting, and release. Each treatment expends funds and can vary widely by treatment method and site conditions. For example planting in dense brush, if not unfeasible, is much more expensive than planting open ground. Replanting or interplanting, because of plantation failure, can be much more expensive than initial planting, depending on the vegetation type and densities present. Costs vary on the method of release, and the number of times an operation must be repeated. Not only do herbicide methods cost less than hand release/hand cutting methods, but they typically do not need to be repeated as many times.

There is a Need to Reduce Short Term Fuels Loading for the Purpose of Reducing the Intensity and Severity of Future Fires

As a result of the Freds fire, surface fuel loading was reduced to very low levels in areas where the fire intensity was moderate to high. The ensuing establishment of grasses, shrubs, and other vegetation is quite variable over the analysis area, and is expected to reach high levels (70 to 90 percent cover) within two to three years.

Establishment of this brush cover over large areas would increase the ability of wildland fires to become large in the future (> 25 years) as the dead component in the vegetation increases. Vegetation development influences potential fire behavior. Immediately post fire (< 5 year) vegetation is dominated by grass followed by a grass/shrub model (5 to 10 years, near future). These types of vegetation develop fires with high rates of spread, but little resistance to control. After this period, the mid future, woody brush will begin to dominate a majority of the area. The young brush, with small diameters and lack of a dead material component, tends to hinder fire intensity and spread for a 10 to 25 year period. After about 25 years (the future), as the dead component of this vegetation increases with time, the probable rates of spread match those of the grass in early development but with far greater intensity, flame lengths and resistance to control risk of a large wild fire increases. Thus, the risk of a large wild fire increases.

Reducing fuels, within the defense and threat zones, to reduce wildfire spread and intensity is a main goal for the Wildland Urban Intermix (WUI) (SNFP ROD, pg 34). Reducing fuels early, while they are small and have low biomass is the most effective way to change the fuels arrangement and reduce the intensity and severity of a future fire (SNFP ROD, pg.49). Early treatments afford the best opportunity to maintain the current low fuel load over time and provide protection during the early stages of stand development. Promoting tree growth while controlling shrub establishment can shorten the timeframe for stands within the project area to develop into fire resistant stands.

The threat of a large wildfire occurring along Highway 50 in the South Fork American River corridor within 5 to 10 years is high. The potential for a wildfire start is high due to proximity to the large number of travelers along Highway 50, a Pacific Gas and Electric Company (PG&E) distribution line that runs through the canyon, residential development, recreational use, and lightning. Some of these starts develop into large wildfires. The Highway 50 corridor has had four large wildfires within the last 31 years, the Pilliken Fire (1973), Wrights Fire (1981), Cleveland Fire (1992) and Freds Fire (2004). The Freds Fire burned into the Cleveland Fire perimeter on the west side and into the Wrights Fire on the east side.

Many factors contribute to fire size, and many, such as weather, slope, and aspect, can not be controlled. Managing fuels is the only way we have to affect fire behavior. Fuel was managed on the 1992 Cleveland Fire, in conjunction with vegetation management for plantation establishment. In 2002, the St. Pauli Fire burned within the 24,000 acre Cleveland fire and burned relatively few acres (234 Forest Service) before it was controlled. In the St Pauli fire area, the vegetation complex was best characterized as fuel model GR 4. The fire was characterized by high rates of spread, but was controlled on the mid-slope at a relatively small size due to this models' rapid reaction to environmental conditions (increased nighttime humidity) and increased line production rate possible in this fuel model. The St Pauli Fire demonstrates the effectiveness of the fuel treatments implemented in the Cleveland fire area..

Fire behavior modeling of timber stands and fuel types that are representative of potential conditions in the future indicates that high intensity fire with rapid rates of spread and high resistance to control would be likely under moderate weather conditions (temperatures above 80 degrees, light winds, and relative humidity less than 25%). Without additional treatments to reduce brush and other vegetation, and decrease resistance to control, large and difficult to control

wildfires will once again threaten the residents of Silverfork and Kyburz, and the other private landowners in this area.

There is a Need to Restore Spotted Owl Travel Corridors Between Owl PACs

The Freds Fire burned at high and moderate severity in over 70 percent of the project area. This resulted in high levels of tree mortality destructing wildlife habitat for spotted owls. Currently early seral vegetation exists in the project area, which hinders spotted owl movement between PACs. Restoring linkages between neighboring PACS would allow for owl dispersal, and would include contiguous habitat of larger trees with moderate to high canopy cover where site conditions allow.

There is a need to control yellow starthistle and eliminate tall white top in the project area to reduce the potential for spread of these invasive plants to other areas of the Forest

The SNFP ROD (page 36) states that the goals for noxious weed management are to manage weeds using an integrated weed management approach including: prevent the introduction of new invaders, conduct early treatment of new infestations, and contain and control established infestations. Two invasive plants are known to occur in the project area; yellow starthistle and tall whitetop.

Tall whitetop occurs in one location in unit 609-41; it occupies less than ¼ acre. There is a need to conduct early treatments of this small infestation of tall whitetop, to eliminate it from the project area.

Yellow starthistle is established along and outward up to 100 feet from some existing Forest roads (11N38, 11N38A, 11N38G, 11N38K, 11N42, and 11N42D) and unnamed trails in Units 609-33 and 613-6, 7, 22, 25, 26, 35, 37, 38, and 47, occupying 72 gross acres in the project area. There is a need to contain and control the established infestation of yellow starthistle to reduce the potential for spread of yellow starthistle to other areas of the Forest.

Public Involvement

The Notice of Intent to prepare an Environmental Impact Statement was published in the Federal Register April 13, 2006. It included an announcement of a Freds Fire Reforestation public meeting, on May 9, 2006. A brief description of the location and type of project was included in the ENF Schedule of Proposed Actions in July 2006. Scoping letters detailing the proposed action and an invitation to a Freds Fire Reforestation open house, on May 24, 2006, were sent to approximately 74 adjacent property owners; potentially affected businesses; federal, state, and local agencies; and special interest groups. As a result of scoping, five individuals responded with comments. Significant issues were raised and an alternative to the proposed action was developed. The Notice of Availability of the Draft Environmental Impact Statement (DEIS) was published in the Federal Register September 11, 2009. The DEIS/project summary was sent to 43 individuals, organizations, tribes, and government agencies. The 45-day comment period ended on October 26, 2009. 21 comment letters were received.

Issues and Alternatives

After reviewing the public scoping comments, the Deciding Officer approved the following significant issues to generate alternatives:

Proposed use of herbicides represents an unknown or unacceptable risk to humans, wildlife, and the environment. Some individuals expressed concerned about the risks associated with the proposed pesticide use to workers and the general public, including Native American plant gatherers. They are very concerned with the hazards created by pesticides in regards to native plants, especially rare and listed flora, amphibians, birds, fish, insects, and soil microorganisms.

Proposed use of herbicide would leave standing dead brush that would pose an immediate fire hazard. Some members of the public were concerned that following herbicide application, much of the existing plant material will die-off and result in substantial dead organic matter on site. This presents a significant fire danger. If the vegetation is left standing, it will become significantly dry and pose an immediate fire hazard. In addition, they are concerned that dead shrubs left standing after spraying, combined with expected cheatgrass proliferation due to herbicide spraying, will mean increased risk of large stand replacing fires that may wipe out reforestation groups and plantations, rendering this project a waste of time and tax payer money. The dead brush, and expected proliferation of cheatgrass and other invasive grasses, could result in fires that would kill the planted seedlings. They suggested an alternative that included cutting unwanted brush, either mechanically, or by hand, leaving it on the ground to discourage new brush growth and noxious weed invasion, and restocking the area the following planting season.

Proposed herbicide use could contaminate water. Some members of the public were concerned about the potential of the proposed action to contaminate water and its effect on water quality.

Proposed use of herbicides could create conditions more hospitable to invasive species and undesirable weeds than were present before the chemicals were applied. McDonald and Everest (1996) found that invasive cheatgrass populations, not observed in the study plots at the beginning of a study, increased more in herbicide-treated plots during a vegetation management study comparing herbicides and non-chemical means of reducing unwanted shrubs. Herbicide treated plots ended the four year study with 743,667 cheatgrass plants per acre with 22% foliar cover, where cheatgrass was 6 times greater in number of plants and more than 7 times greater in foliar cover than in the non-herbicide control plots (130,300 plants per acre, 3% foliar cover). It appears that the invasive cheatgrass was colonizing ground cleared by herbicides.

These issues led the Forest Service to develop alternatives to the proposed action.

Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative.

Alternative 1 is the Proposed Action. Under this alternative about 3,320 acres would be reforested, including initial planting of conifer seedlings on 1,322 acres and replanting or interplanting areas where seedling mortality threatens plantation failure. Currently, about 665 acres would be replanted or interplanted. Herbicides would be used to control vegetation on about 3,320 acres and control or eliminate invasive plants. Herbicides would be applied using ground-based methods, and would include glyphosate, triclopyr, hexazinone, clopyralid, and chlorsulfuron. A combination of broadcast and radial treatments would be used. Oaks would be avoid during planting and protected during release treatments. Non-herbicide zones of varying widths would be implemented adjacent to streams and special aquatic features. Mechanical fuel treatments would be conducted on about 388 acres near the town of Kyburz.

Alternative 2 is the No Action Alternative. Under this alternative no reforestation, release, invasive plant, or fuel treatments would occur. Management activities with existing decision documents would continue to be implemented, which includes 1,868 previously planted acres.

Alternative 3 is similar to Alternative 1 except that 800 fewer acres would be reforested, and non-chemical methods would be used for invasive plant treatments and conifer release.

Comparison of Alternatives: Key Resource Areas

Direct, indirect, and cumulative effects were addressed for each resource area potentially affected by the project. Following is a summary of these effects.

Fire/Fuels

Alternative 1 would create a mosaic of fuel profiles in the project area. Areas treated with herbicides would be maintained into the future (25+ years) at a stage best described by fuel models GR4 and GS2, which are characterized by high to very high rates of spread, and moderate to high flame lengths. While these areas would have a greater spread rate, the resistance to control would be conversely less, meaning that fires would be able to be controlled at a small size. These fuel models also show a greater reaction to live fuel moisture, which means that throughout the majority of the year any fires will be relatively easy to control. The increased ability of fire suppression under this alternative provides the greatest probability of seedling survival. While any small conifer within a likely fire will probably not survive, the ability to contain fires at a smaller size increases the probability of seedling survival across the landscape.

Untreated areas, such as snag patches, low mortality areas, and riparian corridors, would provide areas of least fire spread in the near and mid future (5 to 25 years) as they progressed toward a fuel model SH7, characterized by high spread rates and very high flame lengths. These would aid to limit fire spread in this time period.

Brush would be treated while it is relatively small, so that any contribution to the fuel load of standing dead brush would also be small. These brush skeletons would likely fall over from breakage and/or be crushed by snow during the first or second winter.

Alternative 2 would develop a fuel complex with rapid rates of spread, but little resistance to control (GR4, GS2) across the landscape in the short-term (5-10 years). In the mid future (10-25 years) a fuel complex characterized by low rates of spread and low flame lengths would develop. In the longer term, over a period of 25 years, a fuel complex with rapid rates of spread and a higher resistance to control (SH7) would develop across the landscape. This fuel complex would make the deployment of suppression resources on ridgetops dangerous and ineffective. It would also decrease the effectiveness of suppression resources behind the town of Kyburz, putting this community at risk.

Fire history shows that the area would likely experience a disturbance in the form of a large fire within the next 25 years. Given the fuel conditions in this alternative the effects of this fire would be stand replacing. These circumstances could allow the shrub stages persist indefinitely

Alternative 3 would develop, across the landscape, fuel complexes similar to Alternative 2. Hand treatments around seedlings would have little, if any, effect on the fuels and their development over time as changes to fuels from hand grubbing would be discontinuous and over such a small percentage of the area that these treatments would not change fire behavior substantially from Alternative 2. Thus, this alternative has the same effects as Alternative 2.

Vegetation:

Alternative 1 would result in the establishment of a forested landscape on 80 to 90 percent of the 3,320 acres proposed for treatment. Stand growth would be the highest under this alternative, with trees reaching 75 feet in height and 20 inches in diameter by age 50, reducing the probability of fire-induced mortality associated with smaller trees. Large trees (> 24 inches) would develop in 80-90 years.

Species and structural diversity within stands would be conserved as heritage resource, sensitive plant areas, areas that burned with low intensity in the Freds Fire, and snag patches left untreated

in the Freds Fire Restoration EIS would not be reforested or released. Small patches of early seral vegetation within stands would provide diversity. Hardwoods would be protected and become part of the tree species mix. Areas with a high concentration of surviving or sprouting oaks would maintain a large abundance of oaks. Natural variations such as surviving conifers, rock outcrops, and riparian areas contribute to diversity, as would small patches of early seral vegetation within units. In addition, there would be no herbicide treatment zones for varying widths adjacent aquatic features. Species in the outer part of these zones, especially along ephemeral and seasonal streams, would resemble those of the rest of the unit and would contribute to structural diversity. In the inner portion of these zones, adjacent to live streams, species with high moisture requirements, such as alder, dogwood and willow, would not be treated, contributing to species diversity.

Over the short-term, plant abundance, including culturally important plants, may be affected by herbicide treatments, but no plant species would be eliminated from treatments units. Over the longer-term, culturally important plants favoring early seral, open conditions would be enhanced.

Alternative 2 would result in the establishment of a forested landscape on 300-450 acres, from oak basal sprouting and previously planted areas. A continuous horizontal layer of woody brush would develop, overtopping conifer seedlings and expanding vertically to 10 feet or higher for species such as deerbrush and cherry. Stand growth would be considerably slower, with trees reaching 35 feet in height and 9 inches in diameter by age 50, extending the time these trees would be susceptible to fire-induced mortality associated with smaller trees. Large trees (> 24 inches) would develop in 110 years or longer.

Over the short-term, plant abundance would be unaffected. Over the longer-term, culturally important plants that favor early seral, open conditions could be negatively affected by the continuous horizontal woody brush layer that develops.

Alternative 3 would result in the establishment of a forested landscape on 600-1,100 acres of the project area. Because of the density of vegetation outside of the release circles there would be little to no opportunity to interplant or replant areas with low survival. Stand growth would not be substantially different from Alternative 2 with trees reaching 40 feet in height and 11 inches in diameter by age 50, extending the time these trees would be susceptible to fire-induced mortality associated with smaller trees. Large trees (> 24 inches) would develop in 115 years or longer.

Over the short-term, plant abundance including culturally important plants, may be affected by hand treatments within the hand release radius of trees, but no plant species would be eliminated. Longer-term, culturally important plants that favor early seral, open conditions would be negatively affected by the horizontal woody brush layer that develop, although hand release circles would provide open conditions, at least through the end of the decade.

Botany

Alternative 1 would protect documented occurrences of sensitive plants through avoidance. Direct effects may occur to undiscovered individuals or occurrences of sensitive species located outside the flagged boundaries, but is not likely to lead toward a loss of viability or possible federal or state listing for those sensitive plant species. Increased competition with invasive plants could reduce or displace sensitive plant populations in the short term. Longer term, a forested landscape, which is relatively resistant to invasive plant spread, may indirectly benefit sensitive plants.

Alternative 2 would not directly affect sensitive plants. Short term indirect effects are not expected. Longer term indirect effects could result in an increased risk of invasive plant spread and changes to habitat in the event of a high severity wildfire.

Alternative 3 would protect documented occurrences of sensitive plants through avoidance. Direct effects may occur to undiscovered individuals or occurrences of sensitive species located outside the flagged boundaries. However, effects would be on fewer acres than Alternative 1, and is not likely to lead toward a loss of viability or possible federal or state listing for those sensitive plant species. Short term indirect effects from increased competition with invasive plants would be reduced due to greater cover of native vegetation reducing spread of invasive pants. Longer term indirect effects would be similar to Alternative 2.

Economics

Alternative 1 is expected to have $762 per acre in reforestation costs and produce about 4,900 person days of employment opportunities. Alternative 2 would have no reforestation cost and produce no employment opportunities. Alternative 3 is expected to have $1,906 per acre in reforestation costs, and produce about 15,600 days of employment opportunities, for 800 less acres reforested.

Soils

Soil quality standard would be met under all the alternatives. Herbicide treatments in Alternative 1 would decrease vegetative growth in the short term, but soil cover would be sufficient to protect against soil loss. Short persistence times for herbicides would prevent accumulation of these chemicals in the soil profile. Alternative 2 would produce more vegetative growth and have higher soil cover than Alternative 1. Soil cover and soil loss under Alternative 3 would be similar to Alternative 1, as soil disturbance from hand grubbing would affect a small area, with higher soil cover over the remaining area.

Hydrology, Aquatics

Total water yield may decrease more slowly under Alternatives 2 and 3, the result of faster forest growth under Alternative 1. Alternatives 1 and 3 may physically disturb western pond turtles in suitable habitat through crushing during planting and mastication activities. Potential effects from a large wildfire, a higher risk in Alternatives 2 and 3, include a short term degradation of water quality and aquatic habitat, depending on the severity and extent of a fire.

Wildlife

Alternative 1 will potentially start to provide foraging habitat for spotted owls sooner than the other alternatives. Faster development of oaks and conifers will provide roosting habitat for bats in the long term. Reduction in shrubland habitat will reduce habitat for fox sparrows in the short term. Mountain quail habitat will benefit from increase in early and mid seral coniferous habitat in the short term, but reduced habitat long term as stands mature.

Alternative 2 will delay the development of foraging habitat for spotted owls in already planted areas. Unplanted areas may not provide foraging habitat within 150 years. Foraging habitat for bats will be reduced as montane chaparral matures, reducing prey species associated with open ground. Oaks will provide roosting habitat for bats in the long term. Shrubland habitat will be maintained for fox sparrows. There will be no effects on early and mid seral coniferous habitat associated with Mountain quail.

Alternative 3 will delay the development of foraging habitat for spotted owls in planted areas. Areas remaining unplanted would develop as in Alternative 2. Foraging habitat for bats would be maintained longer than Alternative 1. Oaks and conifers will provide roosting habitat for bats in the long term. Shrubland habitat will be reduced for fox sparrows, but to a lesser extent than Alternative 1. Early and mid seral coniferous habitat associated with Mountain quail would develop on fewer acres than Alternative 1.

Comparison of Alternatives

Indicator Measure		Alternative 1 Proposed Action	Alternative 2 No Action	Alternative 3
Purpose and Need				
Reestablish a forested landscape				
Acres certified with adequate stocking by age five to ten		2,650-3,000	350-600	600-1,100
Reestablish this forested landscape effectively and economically				
Acres with competing vegetation levels below twenty percent (total live ground cover) for a period of two to three years after planting		Would meet goal on about 3,320 acres	None	Would meet goal within critical 5-foot circle around trees on about 2,460 acres, but would not meet short-term goal in units as a whole.
Growth (height and diameter (DBH)) at age 15 and 50	Age 15	Height - 22 feet Diameter - 6.4 inches	Height - 10 feet Diameter - 2.7 inches	Height - 11 feet Diameter - 3.1 inches
	Age 50	Height - 74 feet Diameter - 20 inches	Height - 35 feet Diameter - 9.4 inches	Height - 40 feet Diameter - 10.8 inches
Cost (total and per acre)		$2,530,000 or $762 per acre.	0	$4,688,000 or $1,906 per acre.
Reduce short term fuels loading				
Flame lengths in 90th percentile weather conditions.		0-5 years – 7.3 feet 5-10 years – 5.4 feet 10-25 years - 5.4 feet 25+ years – 5.4 feet	0-5 years – 7.3 feet 5-10 years – 5.4 feet 10-25 years -5.5 feet 25+ years – 15.1 feet	Same as Alternative 2
Percentage of the area in grass or grass/shrub fuel model		Age 0-5 Grass Fuel model over 100% Age 5- 25+ Grass/shrub Fuel model over 85%	Age 0- 5 Grass Fuel model over 100% Age 5- 10 Grass/shrub Fuel model over 100% Age 10-25+ Shrub Fuel model over 100%	Same as Alternative 2
Restore spotted owl travel corridors between owl PACs				
Years to achieve spotted owl foraging and nesting habitat as described by CWHR types 4M/4D/5M/5D, where site conditions allow		Planted acres 4M/4D – 50 years 5M – 80 years 5D - 80 years	Planted acres 4M/4D - 150 years 5M - 150 years 5D - >150 years Unplanted acres unlikely to achieve 4M/4D/5M/5D within 150 years due to < 40% crown closure	Planted acres 4M/4D - 110 years 5M – 115 years 5D - >150 years Unplanted acres unlikely to achieve 4M/4D/5M/5D within 150 years due to < 40% crown closure

Indicator Measure	Alternative 1 Proposed Action	Alternative 2 No Action	Alternative 3
Control yellow starthistle and eliminate tall white top			
Containment of current yellow starthistle population or decreasing in size	Yes	No - yellow starthistle would continue to spread limited only by environmental factors.	No - hand methods are unlikely to be successful because of the size of the yellow starthistle infestation
Elimination of tall whitetop population	Yes	No	Yes
Issues			
Herbicides represents an unknown or unacceptable risk to humans, wildlife, and the environment.			
Risk to human health and safety, based primarily on Hazard Quotients (HQ), measured by comparing the estimated level of exposure (dose) to the Reference dose (RfD) or some other index of acceptable exposure	**Workers**: Low risk to workers. **Public:** Low risk to public. Under normal conditions, members of the general public should not be exposed to substantial levels of any of these herbicides.	No risk from herbicide use	No risk from herbicide use
Risk to wildlife, aquatic, and plant species, based primarily on Hazard Quotients (HQ), measured by comparing the estimated level of exposure (dose) to the No Observed Effect Level (NOEL), No Observed Effect Concentration (NOEC) or some other index of acceptable exposure	Culturally Important Plants		
	Plant abundance may be affected short-term, but no plant species would be eliminated, except tall whitetop. Long-term, culturally important plants that favor open conditions would be enhanced	Plant abundance would be unaffected short-term. Long-term, culturally important plants that favor open conditions could be negatively affected	Plant abundance would be unaffected short-term. Long-term, culturally important plants that favor open conditions could be negatively affected
	Wildlife, Aquatic, and Plant Species		
	Plant species -Little or no damage to sensitive plants from herbicide drift or runoff expected **Aquatic and Terrestrial Species** - Low overall risk (HQ<1) using project design features **Accidental Spill** –Some risk to surrogate species and algae. Project design features (BMPs) prevent or reduce effects of a spill	No risk from herbicide use	No risk from herbicide use

Indicator Measure	Alternative 1 Proposed Action	Alternative 2 No Action	Alternative 3
Proposed use of herbicide would leave standing dead brush that would pose an immediate fire hazard			
Fuel model in immediate future (< 5 years)	GR4 – standing dead brush contribution to fuel load would be small because of relatively small size when treated and would be short-term (1-2 years)	GR4 – no standing dead brush	GR4 – no standing dead brush
Proposed herbicide use could contaminate water			
Levels of herbicides that may be detected as compared to existing guidelines	Short-term: Herbicides (and surfactants and additives) may reach streams under several worse-case scenarios. These concentrations would be below Maximum Contaminant Levels for humans. Long-term: No herbicides in streams **Aquatic and Terrestrial Species -** Low overall risk (HQ<1) using project design features **Accidental Spill** –Some risk to surrogate species and algae. Project design features (BMPs) prevent or reduce effects of a spill	None - no herbicide use	None - no herbicide use
Proposed use of herbicides could create conditions more hospitable to invasive species and undesirable weeds than were present before the chemicals were applied			
Risk of increasing spread of invasive plants in the project area	Short-term: (<5 years) Increased risk of invasive plant invasion with broadcast herbicide treatments. Reduced risk of invasive plant invasion on 510 acres of radial treatments around documented infestations of yellow starthistle and cheatgrass. Long-term: (> 20-25 years) Reduced risk of invasive plant spread with the establishment of a forested landscape.	Short-term: Persistence in openings, but spread unlikely due to shrubs dominating site Long-term: A higher risk of a large-scale high severity fire would potentially facilitate invasion plant expansion in open ground created such a fire.	Short-term: Persistence in openings and radial treatment areas, but spread unlikely due to shrubs dominating site Long-term: Similar to Alternative 2.

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